The emissions must be attenuated according to the following schedule.
(a)
(a) The mean power when using emissions H3E, J3E and R3E:
(a) (1)
(1) On any frequency removed from the assigned frequency by more than 50 percent up to and including 150 percent of the authorized bandwidth:

at least 25 dB for transmitters installed before February 1, 1992,

at least 28 dB for transmitters installed on or after February 1, 1992;
(a) (2)
(2) On any frequency removed from the assigned frequency by more than 150 percent up to and including 250 percent of the authorized bandwidth: At least 35 dB; and
(a) (3)
(3) On any frequency removed from the assigned frequency by more than 250 percent of the authorized bandwidth: At least 43 plus 10log (subscript 10) (mean power in watts) dB.
(b)
(b) For transmitters operating in the band 1626.5-1646.5 MHz. In any 4 kHz band the mean power of emissions shall be attenuated below the mean output power of the transmitter as follows:
(b) (1)
(1) Where the center frequency is removed from the assigned frequency by more than 50 percent up to and including 100 percent of the authorized bandwidth: At least 25 dB;
(b) (2)
(2) Where the center frequency is removed from the assigned frequency by more than 100 percent up to 250 percent of the authorized bandwidth: At least 35 dB; and
(b) (3)
(3) On any frequency removed from the assigned frequency by more than 250 percent of the authorized bandwidth: At least 43 plus 10log (subscript 10) (mean power in watts) dB.
(c)
(c) In any 4 kHz band the peak power of spurious emissions and noise at the input to the transmit antenna must be attenuated below the peak output power of the station as follows:
(c) (1)
(1) 125 dB at 1525.0 MHz, increasing linearly to 90 dB at 1612.5 MHz;
(c) (2)
(2) 90 dB at 1612.5 MHz increasing linearly to 60 dB at 1624.0 MHz;
(c) (3)
(3) 90 dB from 1624.0 MHz to 1650.0 MHz, except at frequencies near the transmitted carrier where the requirements of paragraphs (b)(1) through (3) of this section apply;
(c) (4)
(4) 60 dB at 1650.0 MHz decreasing linearly to 90 dB at 1662.5 MHz;
(c) (5)
(5) 90 dB at 1662.5 MHz decreasing linearly to 125 dB at 1752.5 MHz; and
(c) (6)
(6) 125 dB outside above range, except for harmonics which must comply with (b)(3) of this section.
(d)

(d) The mean power of emissions from radiotelephone survival craft transmitters, 9 GHz search and rescue transponders, and radiotelegraph survival craft transmitters must be attenuated below the mean output power of the transmitter as follows:

(d) (1)

(1) On any frequency removed from the assigned frequency by more than 50 percent, up to and including 100 percent of the authorized bandwidth: at least 25 dB;

(d) (2)

(2) On any frequency removed from the assigned frequency by more than 100 percent of the authorized bandwidth: at least 30 dB.

(e)

(e) The mean power of EPIRBs operating on 121.500 MHz, 243.000 MHz and 406.025 MHz must be as follows:

(e) (1)

(1) On any frequency removed from the assigned frequency by more than 50 percent, up to and including 100 percent of the authorized bandwidth: At least 25 dB;

(e) (2)

(2) On any frequency removed from the assigned frequency by more than 100 percent: at least 30 dB.

(f)

(f) The mean power when using emissions other than those in paragraphs (a), (b), (c) and (d) of this section:

(f) (1)

(1) On any frequency removed from the assigned frequency by more than 50 percent up to and including 100 percent of the authorized bandwidth: at least 25 dB;

(f) (2)

(2) On any frequency removed from the assigned frequency by more than 100 percent up to and including 250 percent of the authorized bandwidth: at least 35 dB; and

(f) (3)

(3) On any frequency removed from the assigned frequency by more than 250 percent of the authorized bandwidth: at least 43 plus 10log (subscript 10) (mean power in watts) dB.

(g)

(g) Developmental stations must conform to the standards for regular authorized stations.

s 80.213 Modulation requirements.

(a)

(a) Transmitters must meet the following modulation requirements:

(a) (1)

(1) When double sideband emission is used the peak modulation must be maintained between 75 and 100 percent;

(a) (2)

(2) When phase or frequency modulation is used in the 156-162 MHz and 216-220 MHz bands the peak modulation must be maintained between 75 and 100 percent. A frequency deviation of +/-5 kHz is defined as 100 percent peak modulation; and

(a) (3)

(3) In single sideband operation the upper sideband must be transmitted. Single sideband transmitters must automatically limit the peak envelope power to their authorized operating power and meet the requirements in s 80.207(c).

(b)

(b) Radiotelephone transmitters using ~~A3E~~, F3E and G3E emission must have a modulation limiter to prevent any modulation over 100 percent. This requirement does not apply to survival craft transmitters, to transmitters that do not require a license or to transmitters whose output power does not exceed 3 watts.

(c)

(c) Coast station transmitters operated in the 72.0-73.0 MHz and 75.4-76.0 MHz bands must be equipped with an audio low-pass filter. The filter must be installed between the modulation limiter and the modulated radio frequency stage. At frequencies between 3 kHz and 15 kHz it must have an attenuation greater than at 1 kHz by at least 40log (subscript 10) (f/3) dB where "f" is the frequency in kilohertz. At frequencies above 15 kHz the attenuation must be at least 28 dB greater than at 1 kHz.

(d)

(d) Ship and coast station transmitters operating in the 156-162 MHz and 216-220 MHz bands must be capable of proper operation with a frequency deviation of sub# 5 kHz when using any emission authorized by s 80.207.

(e)

(e) Coast station transmitters operated in the 156-162 MHz band must be equipped with an audio low-pass filter. The filter must be installed between the modulation limiter and the modulated radio frequency stage. At frequencies between 3 kHz and 20 kHz it must have an attenuation greater than at 1 kHz by at least 60log (subscript 10)(f/3) dB where "f" is the audio frequency in kilohertz. At frequencies above 20 kHz the attenuation must be at least 50 dB greater than at 1 kHz.

(f)

(f) Radiodetermination ship stations operating on 154.585 MHz, 159.480 MHz, 160.725 MHz, 160.785 MHz, 454.000 MHz and 459.000 MHz must employ a duty cycle with a maximum transmission period of 60 seconds followed by a minimum quiescent period four times the duration of the transmission period.

(g)

(g) Radar stations operating in the bands above 2.4 GHz may use any type of modulation consistent with the bandwidth requirements in s 80.209(b).

(h)

(h) Radar transponder coast stations using the 2920-3100 MHz or 9320-9500 MHz band must operate in a variable frequency mode and respond on their operating frequencies with a maximum error equivalent to 100 meters. Additionally, their response must be encoded with a Morse character starting with a dash. The duration of a Morse dot is defined as equal to the width of a space and 1/3 of the width of a Morse dash. The duration of the response code must not exceed 50 microseconds. The sensitivity of the stations must be adjustable so that received signals below -10 dBm at the antenna will not activate the transponder. Antenna polarization must be horizontal when operating in the 9320-9500 MHz band and either horizontal or both horizontal and vertical when operating in the 2920-3100 MHz band. Racons using frequency agile transmitting techniques must include circuitry designed to reduce interference caused by triggering from radar antenna sidelobes.

(i)

(i) Variable frequency ship station transponders operating in the 2920-3100 MHz or 9320-9500 MHz band that are not used for search and rescue purposes must meet the following requirements:

(i) (1)

(1) Non-selectable transponders must have the following characteristics:

(i) (1) (i)

(i) They must respond on all their frequencies with a maximum range error equivalent to 100 meters;

(i) (1) (ii)
(ii) They must use a Morse encoding of "PS" (dot-dash-dash-dot, dot-dot-dot), meaning "You should not come any closer". The width of a Morse dot is defined as equal to the width of a space and 1/3 of the width of a Morse dash;
(i) (1) (iii)
(iii) When they employ swept frequency techniques they must not transmit on any frequency for more than 10 seconds in any 120 second period;
(i) (1) (iv)
(iv) Any range offset of their response must occur during their pause on the fixed frequency;
(i) (1) (v)
(v) The duration of the response code must not exceed 50 microseconds;
(i) (1) (vi)
(vi) The sensitivity of the stations must be adjustable so that received signals below -10 dBm at the antenna input will not activate the transponder;
(i) (1) (vii)
(vii) Antenna polarization must be horizontal when operating in the 9320-9500 MHz band and either horizontal or both horizontal and vertical when operating in the 2920-3100 MHz band.
(i) (1) (viii)
(viii) Transponders using frequency agile techniques must include circuitry designed to reduce interference caused by triggering from radar antenna sidelobes.
(i) (2)
(2) Selectable transponders must be authorized under Part 5 of the Commission's rules until standards for their use are developed.
(j)
(j) The transmitted signals of search and rescue transponders must cause to appear on a radar display a series of at least 20 equally spaced dots.
(k)
(k) The modulation requirements for EPIRB's are contained in Subpart V.

s 80.215 Transmitter power.

(a)
(a) Transmitter power shown on the radio station authorization is the maximum power the licensee is authorized to use. Power is expressed in the following terms:
(a) (1)
(1) For single sideband emission: Peak envelope power;
(a) (2)
(2) For G3E emission: Carrier power;
(a) (3)
(3) For PON and F3N emission: Mean power;
(a) (4)
(4) For all emissions in the 1626.5-1646.5 MHz band: equivalent isotropic radiated power.
(a) (5)
(5) For all other emissions: the carrier power multiplied by 1.67.
(b)
(b) Coast station frequencies below 27500 kHz. The maximum power must not exceed the values listed below.
(b) (1)
(1) Public coast stations, except Alaska:
(b) (1) (i)

(i) Radiotelegraphy:

~~100-160 kHz--80kW~~

~~405-525 kHz--40kW~~

2035-2065 kHz--6.6kW

4000-8000 kHz--10kW

8000-9000 kHz--20kW

12000-27500 kHz--30kW
(b) (1) (ii)
(ii) Radiotelephony:

2000-4000 kHz--day--800W

2000-4000 kHz--night--400W

4000-27500 kHz--10kW
(b) (2)
(2) Private coast stations, except in Alaska: 1kW
(b) (3)
(3) Coast stations in Alaska, public and private:

405-525 kHz--265W

1605-12000 kHz--150W
(c)
(c) Coast station frequencies above 27500 kHz. The maximum power must not exceed the values listed below.
(c) (1)

(1) Coast stations:

156-162 MHz--50W [FN1] [FN12]

[FN1] Maximum authorized power at the input terminals of the station antenna.

[FN12] The frequencies 156.375 MHz and 156.650 MHz are primarily intership frequencies. When authorized for coast stations on a secondary basis, the normal output power must not exceed 1 watt and the maximum output power must not exceed 10 watts.

216-220 MHz [FN2]

[FN2] See paragraph (h) of this section.

(c) (2)
(2) Marine utility stations: 156-162 MHz--10W

(d)
(d) Ship station frequencies below 27500 kHz. The maximum power must not exceed the values listed below:
(d) (1)
(1) Radiotelegraphy: All ships--2kW [FN3]

[FN3] For passenger ships 5000 gross tons and over--8kW. For cable repair ships operating on radiodetermination frequencies, 15 watts; see s 80.375(b).

(d) (2)
(2) Radiotelephony:
(d) (2) (i)
(i) All ships--Great Lakes and Inland Waters--150W
(d) (2) (ii)
(ii) All ships--Open waters; 2000-4000 kHz--150W

2182 kHz--emergency, urgency, or safety ship to shore--400W [FN4]

[FN4] For passenger ships 5000 gross tons and over--1kW.

(d) (2) (iii)
(iii) All ships--Open waters; 4000-27500 kHz--1.5kW [FN5].

[FN5] For passenger ships 5,000 gross tons and over 3kW.

(d) (3)
(3) Digital selective calling:

All ships 415-526.5 kHz--400 W

All ships 1605-4000 kHz--400 W

All ships 4000-27500 kHz--1.5 kW
(e)
(e) Ship stations frequencies above 27500 kHz. The maximum power must not exceed the values listed below.
(e) (1)
(1) Ship stations 156-162 MHz--25W [FN6]

[FN6] Reducible to 1 watt or less, except for transmitters limited to public correspondence channels and used in an automated system.

Marine utility stations and hand-held portable transmitters 156-162 MHz--10W;
(e) (2)
(2) Ship stations 216-220 MHz--25W [FN7]

[FN7] Reducible to 2.5 watts or less; see paragraph (i) of this section.

(e) (3)
(3) On board stations 456-468 MHz--4W [FN8]

[FN8] Certification based on a carrier power of 4 watts with transmitter connected to a dummy load of matching impedance. The effective radiated power must not exceed 2 watts.

(e) (4)
(4) Ship earth stations 1626.5-1646.5 MHz [FN9]

[FN9] See paragraph (k) of this section.

(e) (5)
(5) Ship radar stations with F3N emission--200 mW
(e) (6)
(6) EPIRB--121.500 and 243.00 MHz [FN10]

[FN10] See Subpart V of this part.

(e) (7)
(7) EPIRB--156.750 and 156.800 MHz [FN10]

[FN10] See Subpart V of this part.

(f)
(f) Fixed stations. The maximum power must not exceed the values listed below.
(f) (1)
(1) Maritime support (receiver test):

R3E and J3C emission--150W

F3E emission--50W
(f) (2)
(2) Operational fixed: 72-76 MHz and above 162 MHz [FN11]

[FN11] See paragraph (l) of this section.

(f) (3)
(3) Alaska--Private fixed:

10-200 kHz--650W

405-525 kHz--265W

1605-12000 kHz--150W
(f) (4)
(4) Alaska--Public fixed:

405-525 kHz--1kW

1605-12000 kHz--1kW.

(g)

(g) The carrier power of ship station radiotelephone transmitters, except portable transmitters, operating in the 156-162 MHz band must be at least 8 but not more than 25 watts. Transmitters that use 12 volt lead acid storage batteries as a primary power source must be measured with a primary voltage between 12.2 and 13.7 volts DC. Additionally, unless otherwise indicated, equipment in radiotelephone ship stations operating in the 156-162 MHz band must meet the following requirements:

(g) (1)

(1) All transmitters must be capable of reducing the carrier power to one watt or less;

(g) (2)

~~(2) All remote control units that are used with transmitters manufactured after August 31, 1979, or installed after February 29, 1980, must be capable of causing the carrier power to be reduced to one watt or less;~~

(g) (3)

(3) Except as indicated in (4) of this paragraph, all transmitters ~~manufactured after January 21, 1987, or~~ in use a~~fter January 21, 1997~~, must automatically reduce the carrier power to one watt or less when the transmitter is tuned to 156.375 MHz or 156.650 MHz, and must be provided with a manual override switch which when held by an operator will permit full carrier power operation on 156.375 MHz and 156.650 MHz;

(g) (4)

(4) Hand-held portable transmitters are not required to comply with the automatic reduction of carrier power in (g)(3) of this section; and.

(g) (5)

(5) Transmitters dedicated for use on public correspondence duplex channels as additional equipment to a VHF ship station in the Great Lakes which meet all pertinent rules in this part are not required to reduce their carrier power to one watt.

(h)

(h) Coast stations in an AMTS may radiate as follows, subject to the condition that no harmful interference will be caused to television reception except that TV services authorized subsequent to the filing of the AMTS station application will not be protected.

(h) (1)

(1) When located more than 169 kilometers (105 miles) from the antenna of a channel 13 TV station and more than 129 kilometers (80 miles) from the antenna of a channel 10 station, the ERP of coast stations having an antenna height of 61 meters (200 feet) or less above ground must not exceed 1000 watts.

(h) (2)

(2) Coast stations located less than 169 kilometers (105 miles) from a channel 13 TV station, or less than 129 kilometers (80 miles) from a channel 10 station or when using a transmitting antenna height above ground greater than 61 meters (200 feet), must submit a plan to limit interference to TV reception. The plan must include:

(h) (2) (i)

(i) A description of the interference contour with identification of the method used to determine this contour; and

(h) (2) (ii)

(ii) A statement concerning the number of residences within the interference contour. The interference contour includes only areas inside the TV grade B contour with the latter determined assuming maximum permissible TV antenna height and power for broadcast stations and the actual facility parameters for translators and low power TV stations. See Part 73,

Subpart E of this chapter for further information on TV grade B contour determination.

(h) (3)

(3) When located as described in paragraph (h)(2) of this section, the coast station (or stations affecting the same TV Grade B contour) will be authorized if the applicant's plan has limited the interference contour(s) to fewer than 100 residences or if the applicant:

(h) (3) (i)

(i) Shows that the proposed site is the only suitable location;

(h) (3) (ii)

(ii) Develops a plan to control any interference caused to TV reception within the grade B contour from its operations; and

(h) (3) (iii)

(iii) Agrees to make such adjustments in the TV receivers affected as may be necessary to eliminate interference caused by its operations.

(h) (4)

(4) The applicant must eliminate any interference caused by its operation to TV reception within the grade B contour that might develop within 90 days of the time it is notified in writing by the Commission. If this interference is not removed within the 90-day period, operation of the coast station must be discontinued. The licensee is expected to help resolve all complaints of interference, whether inside or outside the grade B contour.

(h) (5)

(5) The transmitter output power must be 50 watts or less.

(i)

(i) A ship station must have a transmitter output power not exceeding 25 watts and an ERP not exceeding 18 watts. The transmitter must include the capability to reduce the carrier power to 2.5 watts with a front panel control. The maximum transmitter output power is permitted to be increased to 50 watts under the following conditions:

(i) (1)

(1) Increases exceeding 25 watts are made only by radio command from the controlling coast stations; and

(i) (2)

(2) The application for an equipment authorization demonstrates that the transmitter output power is 25 watts or less when external radio commands are not present.

(j)

(j) A ship installation with a transmitter output power exceeding 25 watts under the conditions of paragraph (i) of this section is exempted from the limitation of 18 watts ERP when operating in specific geographical areas identified in a plan for the use of higher power.

(k)

(k) Within the 1626.5-1646.5 MHz band the maximum e.i.r.p by a ship earth station in any direction in the horizontal plane or in the direction of the space station must not exceed +40 dB relative to one watt in any 4 kHz band in the main beam, except upon a satisfactory showing of need for greater power, in which case a maximum of +55 dB relative to one watt may be authorized.

(l)

(l) For operational fixed stations using frequencies in the 72-76 MHz band and for other classes of stations operating above 162.025 MHz, the transmitter power must be specified in the station authorization. Frequencies in the 72-76 MHz band are listed in s 80.381. The operational requirements for 72-76 MHz are contained in Subpart L of this part.

(m)

(m) For radiodetermination transmitters using A1D, A2D, F1D, F2D, G1D and G2D emissions on 154.585 MHz, 159.480 MHz, 160.725 MHz, 160.785 MHz, 454.000 MHz and

459.000 MHz the mean output power of the unmodulated carrier must not exceed 25 watts.
(n)
(n) For radiodetermination stations operating above 2400 MHz the output power must be as follows:
(n) (1)
(1) For radar stations that use F3N emission the mean output power must not exceed 200 milliwatts;
(n) (2)
(2) For search and rescue stations the output power must be at least 400 milliwatts peak e.i.r.p.
(n) (3)
(3) For all other transponder stations the output power must not exceed 20 watts peak e.i.r.p. Licensees of non-selectable transponder coast stations operating in the 2920-3100 MHz and 9320-9500 MHz bands must notify in writing the USCG District Commander of any incremental increase of their station's output power above 5 watts peak e.i.r.p.

s 80.217 Suppression of interference aboard ships.

(a)
(a) A voluntarily equipped ship station receiver must not cause harmful interference to any receiver required by statute or treaty.
(b)
(b) The electromagnetic field from receivers required by statute or treaty must not exceed the following value at a distance over sea water of one nautical mile from the receiver:

Frequency of interfering emissions	Field intensity in microvolts per meter
Below 30 MHz	0.1
30 to 100 MHz	.3
100 to 300 MHz	1.0
Over 300 MHz	3.0

or

Deliver not more than the following amounts of power, to an artificial antenna having electrical characteristics equivalent to those of the average receiving antenna(s) use on shipboard:

Frequency of interfering emissions	Power to artificial antenna in microwatts
Below 30 MHz	400
30 to 100 MHz	4,000
100 to 300 MHz	40,000
Over 300 MHz	400,000

s 80.219 Special requirements for narrow-band direct-printing (NB-DP) equipment.

NB-DP and data transmission equipment installed in ship and coast stations before October 1, 1990, that operates on the frequencies in the 4,000-27,500 kHz bands must be capable of operation in accordance with the technical requirements of either CCIR Recommendation 476 or CCIR Recommendation 625 and may be used indefinitely. Equipment installed on or after October 1, 1990, must be capable of operation in accordance with the technical requirements of CCIR Recommendation 625. NB-DP and data transmission equipment are additionally permitted to utilize any modulation, so long as emissions are within the limits set forth in s 80.211(f) and the equipment is also capable of operation in accordance with CCIR recommendation 625.

s 80.221 Special requirements for automatically generating the radiotelephone alarm signal.

(a)
(a) Each device for automatically generating the radiotelephone alarm signal must be capable of being disabled to permit the immediate transmission of a distress call and message.
(b)
(b) The device must comply with the following requirements:
(b) (1)
(1) The frequency tolerance of each tone must be +/-1.5 percent;
(b) (2)
(2) The duration tolerance of each tone must be +/-50 milliseconds;
(b) (3)
(3) The interval between successive tones must not exceed 50 milliseconds; and
(b) (4)
(4) The amplitude ratio of the tones must be flat within 1.6 dB.
(c)
(c) Devices installed on or after January 1, 1983, must comply with the following requirements:
(c) (1)
(1) The frequency tolerance of each tone must be +/-1.5 percent;
(c) (2)
(2) The duration tolerance of each tone must be +/-10 milliseconds;
(c) (3)
(3) The interval between successive tones must not exceed 4 milliseconds;
(c) (4)
(4) The amplitude ratio of the tones must be flat within 1.6 dB;
(c) (5)
(5) The output of the device must be sufficient to modulate the associated transmitter for H2B emission to at least 70 percent, and for J2B emission to within 3 dB of the rated peak envelope power;
(c) (6)
(6) Light from the device must not interfere with the safe navigation of the ship;
(c) (7)
(7) After activation the device must automatically generate the radiotelephone alarm signal for not less than 30 seconds and not more than 60 seconds unless manually interrupted;

(c) (8)
(8) After generating the radiotelephone alarm signal or after manual interruption the device must be immediately ready to repeat the signal;
(c) (9)
(9) The transmitter must be automatically switched from the stand-by condition to the transmit condition at the start and return to the stand-by condition at the conclusion of the radiotelephone alarm signal.
(d)
(d) Any device used by a station to automatically generate the radiotelephone alarm signal must be certificated by the Commission.

s 80.223 Special requirements for survival craft stations.

(a)
(a) Survival craft stations capable of transmitting on:
(a) (1)
(1) ~~500 kHz must be able to operate with class A2A and A2B or H2A and H2B emissions;~~
(a) (2)
(2) 2182 kHz must be able to operate with A2B and A3E or H2B and H3E and J2B and J3E emissions;
(a) (3)
(3) ~~8364 kHz must be able to operate with class A2A or H2A emission; and~~
(a) (4)
(4) 121.500 MHz must be able to operate with A3E or A3N emission.
(b)
(b) Survival craft stations must be able to receive the frequency and types of emission which the transmitter is capable of using. ~~Where the transmitter frequency is 8364 kHz the receiver must be able to receive A1A, A2A and H2A emissions throughout the 8320-8745 kHz band~~.
(c)
(c) ~~Survival craft transmitters operating on 500 kHz or on 8364 kHz must be able to be manually keyed. If provisions are made for automatically transmitting the radiotelegraph alarm signal or the radiotelegraph distress signal, such provisions must meet the requirements in Subpart F of this part~~.
(d)
(d) Any EPIRB carried as part of a survival craft station must comply with the specific technical and performance requirements for its class contained in subpart V of this chapter.

s 80.225 Requirements for selective calling equipment.

This section specifies the requirements for voluntary digital selective calling (DSC) equipment and selective calling equipment installed in ship and coast stations. Reference to any CCIR Recommendation in this section is to the most recent CCIR approved Recommendation that does not prevent the use of existing equipment.
(a)
(a) DSC equipment voluntarily installed in coast or ship stations must meet either the requirements of CCIR Recommendation 493 (including only equipment classes A, B, D, and E) or RTCM Paper 56-95/SC101-STD. DSC equipment must not be used with the sensors referred to in s 80.179(e)(2). DSC equipment used on compulsorily fitted ships must meet the requirements contained in subpart W for GMDSS.

(b)
(b) Manufacturers of Class C DSC equipment to be used on United States vessels must affix a clearly discernible permanent plate or label visible from the operating controls containing the following:

Warning. This equipment is designed to generate a digital maritime distress and safety signal to facilitate search and rescue. To be effective as a safety device, this equipment must be used only within communication range of a shore-based VHF marine channel 70 distress and safety watch system. The range of the signal may vary but under normal conditions should be approximately 20 nautical miles.
(c)
(c) Selective calling equipment, other than that designed in accordance with paragraph (a) of this section, is authorized as follows:
(c) (1)
(1) Equipment used in conjunction with the Automated Maritime Telecommunications System (AMTS) in the band 216-220 MHz,
(c) (2)
(2) Equipment used to perform a selective calling function during narrow-band direct-printing (NB-DP) operations in accordance with CCIR Recommendation 476 or 625, and
(c) (3)
(3) Equipment functioning under the provisions of s 80.207(a) includes the brief use of radiotelegraphy, including keying only the modulating audio frequency, tone signals, and other signalling devices to establish or maintain communications provided that:
(c) (3) (i)
(i) These signalling techniques are not used on frequencies designated for general purpose digital selective calling (DSC) and distress and safety DSC calling as listed in s 80.359;
(c) (3) (ii)
(ii) The authorized radiotelephone emission bandwidth is not exceeded;
(c) (3) (iii)
(iii) Documentation of selective calling protocols must be available to the general public; and,
(c) (3) (iv)
(iv) Harmful interference is not caused to stations operating in accordance with the International Radio Regulations.

s 80.227 Special requirements for protection from RF radiation.

As part of the information provided with transmitters for ship earth stations, manufacturers of each such unit must include installation and operating instructions to help prevent human exposure to radiofrequency (RF) radiation in excess of the RF exposure guidelines specified in 1.1307(b) of the Commission's Rules.

s 80.229 Special requirements for automatic link establishment (ALE).

Brief signalling for the purposes of measuring the quality of a radio channel and thereafter establishing communication shall be permitted within the 2 MHz-30 MHz band. Public coast stations providing high seas service are authorized by rule to use such signalling under the following conditions:

(a)

(a) The transmitter power shall not exceed 100 W ERP;

(b)

(b) Transmissions must sweep linearly in frequency at a rate of at least 60 kHz per second, occupying any 3 kHz bandwidth for less than 50 milliseconds;

(c)

(c) The transmitter shall scan the band no more than four times per hour;

(d)

(d) Transmissions within 6 kHz of the following protected frequencies and frequency bands must not exceed 10 mW peak ERP:

(d) (1)

(1) Protected frequencies (kHz)

2091.0	4188.0	6312.0	12290.0	16420.0
2174.5	4207.5	8257.0	12392.0	16522.0
2182.0	5000.0	8291.0	12520.0	16695.0
2187.5	5167.5	8357.5	12563.0	16750.0
2500.0	5680.0	8364.0	12577.0	16804.5
3023.0	6215.0	8375.0	15000.0	20000.0
4000.0	6268.0	8414.5	16000.0	25000.0
4177.5	6282.0	10000.0		

(d) (2)

(2) Protected bands (kHz)

4125.0-4128.0

8376.25-8386.75

13360.0-13410.0

25500.0-25670.0

(e)

(e) The instantaneous signal, which refers to the peak power that would be measured with the frequency sweep stopped, along with spurious emissions generated from the sweeping signal, must be attenuated below the peak carrier power (in watts) as follows:

(e) (1)

(1) On any frequency more than 5 Hz from the instantaneous carrier frequency, at least 3 dB;

(e) (2)

(2) On any frequency more than 250 Hz from the instantaneous carrier frequency, at least 40 dB; and

(e) (3)

(3) On any frequency more than 7.5 kHz from the instantaneous carrier frequency, at least 43 + 10log sub10 (peak power in watts) db.

s 80.251 Scope.

(a)

(a) This subpart gives the general technical requirements for certification of equipment used on compulsory ships. Such equipment includes ~~radiotelegraph transmitters, radiotelegraph auto alarms~~, automatic-alarm-signal keying devices, survival craft radio equipment, watch receivers, and radar.

(b)

(b) The equipment described in this subpart must be certificated.

(c)

(c) The term "transmitter" means the transmitter unit and all auxiliary equipment necessary to make this unit operate as a main or emergency transmitter in a ship station at sea. Each separate motor-generator, rectifier, or other unit required to convert the ship primary power to the phase, frequency, or voltage necessary to energize the transmitter unit is considered a component of the transmitter.

(d)

(d) "Average ship station antenna" means an actual antenna installed on board ship having a capacitance of 750 picofarads and an effective resistance of 4 ohms at a frequency of 500 kHz, or an artificial antenna having the same electrical characteristics.

s 80.253 Technical requirements for main transmitter.

(a)

(a) The following table gives the operating carrier frequency, emission, modulation and average ship station antenna power requirements for the main transmitter.

Operating frequency (kHz)	Frequency tolerance		Class of emission	Percentage modulation for amplitude modulation	Modulation frequency for amplitude modulation	Power into average ship station antenna
	Parts [FN1] in 10 super6	Hz [FN2]				
~~500 kHz ..... 1,000~~	~~20~~		~~A2A and A2B or H2A and H2B.~~	~~Not less than 70; not more than 100.~~	~~At least 1 frequency between 300 and 1250 Herts, except for transmittal installed after July 1, 1951, at least 1 frequency between 450 and 1250 Herts.~~	~~Not less than 200 watts.~~
~~Do ..... 1,000~~	~~20~~		~~A1A or J2A.....~~	.....	.....	~~Not less than 160 watts.~~
410 and 2 working frequencies						

in the band 415 to 525...	1,000	20	A2A and A3N or H2A and H3N.	Not less than 70; not more than 100.	At least 1 frequency between 300 and 1250 Hertz, except for transmitters installed after July 1, 1951, at least 1 frequency between 450 and 1250 Hertz.	Not less than 200 watts.
Do	1,000	20	A1A and NON or J2A and J3N.	.....	.....	Not less than 160 watts.

FN1 For equipment approved before November 30, 1977.
FN2 For equipment approved after November 29, 1977.

(b)

(b) A main transmitter must operate at its required antenna power when adjusted to any required operating frequency and energized by the main power supply of the ship station or by an equivalent power supply.

(c)

(c) A main transmitter must be equipped to measure (1) antenna current, (2) transmitter power supply voltages, and (3) anode or collector current(s).

(d)

(d) The antenna power must be determined at the operating carrier frequency by the product of the antenna resistance and the square of the average antenna current, both measured at the same point in the antenna circuit at approximately ground potential.

(e)

(e) A main transmitter producing more than 250 watts output power must have the output power reduced to not more than 150 watts when used for telegraphy. In stations where a separate telegraph transmitter operable on the same frequencies as the main transmitter with an output power of less than 250 watts, is installed, the power reduction requirement does not apply. Such separate transmitters must not obtain power from the emergency power supply.

s 80.255 Technical requirements for reserve transmitter.

(a)

(a) The following table describes the operating carrier frequency, emission, modulation and average ship station antenna power requirements for the reserve transmitter.

Operating frequency (kHz)	Frequency tolerance: Parts [FN1] in 10 super6	Frequency tolerance: Hz [FN2]	Class of emission	Percentage modulation for amplitude modulation	Modulation for frequency for amplitude modulation	Power into an average ship station antenna
500	[FN3]1,000	20	A2A and A2B or H2A and H2B.	Not less than 70; not more 100.	At least 1 frequency between 300 and 1250 Hertz except for transmitters installed after July 1, 1951, at least 1 frequency between 450 and 1250 Hertz.	Not less than 25 watts.
410 and 1 working frequency in the band 415 to 525.	[FN3]1,000	20	A2A and A3N or H2A and H3N.	...do....	...do.....	...do

[FN1] For equipment approved before November 30, 1977.
[FN2] For equipment approved after November 29, 1977.
[FN3] Except for reserve transmitters whose use is confined solely to safety communications. Such transmitters must maintain a frequency tolerance of 3000 parts in 10. super6

(b)
(b) A reserve transmitter must operate at its required antenna power when adjusted to the operating frequency and energized by the reserve power supply of the ship station or by an equivalent power supply.
(c)
(c) A reserve transmitter must be equipped to measure antenna current.
(d)
(d) The antenna power must be determined at the operating carrier frequency by the product of the antenna resistance and the square of the average antenna current both measured at the same point in the antenna circuit at approximately ground potential.

s 80.257 Manufacturing requirements for radiotelegraph automatic alarm receiver (auto alarm).

(a)

(a) The auto alarm must consist of:

(a) (1)

(1) A radio receiver capable of receiving emissions of classes A1A, A1B, A2A, A2B, H2A, H2B, J2A, and J2B over the frequency range 496 through 504 kHz.

(a) (1) (i)

(i) The receiver must reject signals +106 dB above one microvolt at +/-150 kHz from the center frequency and +88 dB above one microvolt at +/-40 kHz from the center frequency.

(a) (1) (ii)

(ii) The receiver must respond to signals from 100 microvolts to 1 volt on the center frequency. There must be less than 6 dB variation in sensitivity from 496 kHz through 504 kHz.

(a) (2)

(2) A device capable of selecting the alarm signal specified under s 80.259 (a) and (b).

(a) (3)

(3) A minimum of 3 audible alarm units to meet the three location installation requirements of s 80.259(g).

(a) (4)

(4) A testing device to determine locally that the auto alarm system is operative.

(b)

(b) The auto alarm may be constructed in one or more units but must be independent of the ship's regular radio receiving apparatus.

(c)

(c) A telephone jack must be provided to permit reception by a telephone receiver.

(d)

(d) Tuning and timing controls must not be accessible from the exterior of the device.

(e)

(e) Once set into operation the audible alarms must continue to function until switches off in the principal radiotelegraph operating room.

(f)

(f) A nonlocking or momentary-throw switch must be provided to permit temporary disconnection of the audible alarm on the bridge and in the operator's quarters when the auto alarm system is being tested.

(g)

(g) A failure of the auto alarm power supply must activate the audible alarms.

(h)

(h) The auto alarm must operate within specifications throughout the temperature range 0-50 degrees Celsius at relative humidities as high as 95%.

(i)

(i) The auto alarm must be protected from excessive currents, power supply reversals and voltage variations which could cause damage to any component.

(j)

(j) The auto alarm must be capable of operating when subjected to vibrations having a frequency between 20 and 30 Hertz and an amplitude of 0.76 mm (0.03 inch) in a direction at an angle of 30 to 45 degrees with the base of the auto alarm.

s 80.259 Technical requirements for radiotelegraph auto alarm receiver.

(a)

(a) For certification the auto alarm in the absence of interference must be capable of being operated by four consecutive dashes whose length may vary from 6.0 to 3.5 seconds and the intervening spaces vary between 1.5 seconds to 10 milliseconds. These types of auto alarms must not respond to dashes longer than 6.31 seconds or shorter than 3.33 seconds nor to intervening spaces longer than 1.58 seconds or shorter than 5 milliseconds except as follows:

(a) (1)

(1) Non-digital types employing resistance-capacitance timing, approved before October 1, 1969, and placed in service on or before January 1, 1985, must not respond to dashes longer than 7.40 seconds or shorter than 2.80 seconds, nor to space intervals longer than 1.80 seconds or shorter than 5 milliseconds.

(a) (2)

(2) Digital types employing a stable clock as the basic timing device, approved before May 1, 1968, and placed in service on or before December 1, 1975, may accept dashes whose lower limits extends down to 3.0 seconds.

(b)

(b) The auto alarm must operate with a signal of 100 microvolts RMS at 500 kHz applied to an artificial antenna consisting of a 20 microhenry inductance, a 500 picofarad capacitor, and a 5 ohm resistor connected in series in the absence of any interference and without manual adjustment. It must be capable of operation under these conditions on the following classes of emission:

(b) (1)

(1) A1B;

(b) (2)

(2) A2B with a carrier modulated at any modulation percentage from 30 through 100 percent with any modulation frequency from 300 through 1350 Hertz; and

(b) (3)

(3) H2B with a carrier keyed and emitted at any power level from 3 through 6 decibels below peak envelope power, with any modulation frequency from 300 through 1350 Hertz.

(c)

(c) The auto alarm must operate with signal levels up to 1 volt under normal operating conditions.

(d)

(d) The auto alarm warning device must not be activated by atmospherics or by any signal from the antenna other than the alarm signal.

(e)

(e) The auto alarms must respond to the alarm signal through non-continuous interference caused by atmospherics and powerful signals other than the alarm signal. In the presence of atmospherics or interfering signals, the auto alarm must automatically adjust itself within a reasonable time to the condition in which it can most readily distinguish the alarm signal.

(f)

(f) The auto alarm must respond without adjustment and with practically uniform sensitivity to signals over a band extending no less than 4 kHz on each side of the 500 kHz radiotelegraph frequency and with a minimum attenuation of:

5 dB at 495.0 kHz and 505.0 kHz

40 dB at 487.0 kHz and 513.0 kHz

80 dB at 475.0 kHz and 525.0 kHz

(g)

(g) When the auto alarm is activated it must sound continuously a warning in the radiotelegraph operating room, in the radio operator's cabin, and on the bridge.

(h)

(h) The auto alarm must include a 500 kHz signal generator and a keying device which automatically disconnects the auto alarm from the antenna when an alarm signal of 100 microvolts is applied to test the auto alarm.

s 80.261 Technical requirements for automatic-alarm-signal keying device.

(a)

(a) The automatic-alarm-signal keying device may consist of one or more units.

(b)

(b) The device must be designed to activate the keying circuits of any transmitter approved by the Commission for use as a main or reserve transmitter.

(c)

(c) Timing-adjustment controls must not be accessible from the exterior of the device.

(d)

(d) The device must be able to repeatedly transmit the alarm signal. For this purpose the dashes transmitted must have a duration of 3.8 to 4.2 seconds, and spaces between each of the twelve dashes constituting a series must have a duration of 0.8 to 1.2 seconds. Spaces between each series of twelve dashes must have a duration of 0.8 second to one minute. This operation must be sustainable with power supply voltage variations of +/-15%.

(e)

(e) A single control, protected to avoid accidental manipulation, must be provided for placing the device into full operation within 30 seconds. Once in operation, the device must be capable of continuous operation without attention for a least one hour.

(f)

(f) When the "on-off" control of the device is placed in the "off" position, the keying circuit to the radio transmitter(s) must be automatically opened.

(g)

(g) The automatic-alarm-signal keying device must be capable of operation from a power supply independent of ship power. It may operate from the radio station emergency power supply.

(h)

(h) Instructions for adjustment of the device and the correct indication of any instrument incorporated to reveal improper operation must be inscribed on a plate mounted on the device in a position to be easily read by the operator.

(i)

(i) The keying circuit must be capable of switching 0.75 amperes DC through a 32 ohms non-inductive resistance. If the automatic-alarm-signal keying device is also intended to be used with transmitters requiring a keying circuit capability of 2 amperes DC through a 115 ohms non-inductive resistance, the keying circuit of the device must comply with this latter requirement.

(j)

(j) The automatic-alarm-signal keying device must operate within specifications throughout the temperature range 0-50 degrees Celsius at relative humidities as high as 95%.

(k)

(k) The automatic-alarm-signal keying device must be protected from excessive currents, power supply reversals and voltage variations which could cause damage to any component.

(l)

~~(1) The automatic-alarm-signal keying device must be capable of operating when subjected to vibrations having a frequency between 20 and 30 Hertz and an amplitude of 0.76 mm (0.03 inch) in a direction at an angle of 30 to 45 degrees with the base of the automatic-alarm-signal keying device~~.

s 80.263 Common requirements for survival craft radio equipment.

In addition to the requirements set forth in ss 80.265 and 80.267, survival craft radio equipment must comply with the following:

(a)

(a) The radio equipment must be operable without tools.

(b)

(b) Each equipment must be provided with an instruction manual covering the design, installation, operation, and maintenance of the equipment.

(c)

(c) Simple instructions for the operation of the equipment must be prominently and permanently attached to it. These instructions must include information about the erection of the antenna(s), ~~and automatic and manual transmission of the international distress and alarm signals on 500 kHz~~.

(d)

(d) An artificial antenna for test purposes must be provided.

(e)

(e) The survival craft radio transmitter must meet the following:

(e) (1)

(1) Must be pretuned to the required frequencies. The operating frequencies must be maintained within the prescribed tolerances under varying voltages, antenna circuit characteristics, and other normal conditions of adjustment, and shock or vibration. The frequency control circuit adjustments must not be readily available to the person using the transmitter;

(e) (2)

(2) Antenna tuning controls must be provided on the operating panel. An initial adjustment of these controls must resonate the antenna circuit at each required operating radio frequency. Resonance must be maintained without further adjustment of the controls during a normal operating period of the transmitter;

(e) (3)

(3) The front panel must contain controls for manual operation on 500 kHz, manual operation on 8364 kHz, and automatic operation alternately on these two frequencies. Not more than one manual switch adjustment must be necessary to transmit automatically. For manual radiotelegraphy the transmitter and receiver, including their controls, must be arranged so that they can be operated from the same operating position and the time necessary to change from transmission to reception and vice versa must not exceed two seconds; and

(e) (4)

(4) In automatic operation the radio must:

(e) (4) (i)

(i) On 500 kHz transmit the international radiotelegraph alarm signal followed by the international radiotelegraph distress signal, the latter to be transmitted in one or more separate groups, each group consisting of three separate distress signals;

(e) (4) (ii)

(ii) On 8364 kHz transmit the international radiotelegraph distress signal in one or more separate groups, each group consisting of three separate distress signals; this group or these groups to be followed by a continuous long dash of not less than 30 seconds in duration;

(e) (4) (iii)

(iii) Transmit the specified signals by automatically changing the operating frequency of the transmitter from 500 kHz to 8364 kHz and vice versa with a transfer time interval not to exceed one second;

(e) (4) (iv)

(iv) Completely de-energize the receiver during operation of the transmitter;

(e) (4) (v) (v) Be capable of testing the required automatic keying arrangement without the generation of radio frequency energy; and

(e) (4) (vi)

(vi) For automatic transmission of the international radiotelegraph distress signal, not exceed 16 words per minute or be less than 8 words per minute. The alarm signal dashes must have a duration within the limits of 3.8 to 4.2 seconds, and the spaces between each of the 12 dashes constituting a series must have a duration within the limits of 0.8 to 1.2 seconds.

(f)

(f) Survival craft radio receivers must meet the following requirements:

(f) (1)

(1) The receiver must be capable of receiving A2A or H2A emission over the 492-508 kHz band without manual tuning and when manually tuned must be capable of receiving A1A and A2A or H2A and J2A emission on any frequency in the 8320- 8745 kHz band;

(f) (2)

(2) The selectivity of the receiver preceding the final detector must be flat within 6 dB over the band 492 to 508 kHz;

(f) (3)

(3) The audio frequency response of the receiver must be flat within 6 dB over the range of frequencies between 400 and 1400 Hertz; and

(f) (4)

(4) The receiver must be equipped with only one manually operated volume control.

(g)

(g) The artificial antenna must meet the following requirements:

(g) (1)

(1) Provide a reliable test load for the transmitter at the frequencies 500 kHz and 8364 kHz of approximately the same electrical characteristics as the single wire or collapsible rod antenna required by this section;

(g) (2)

(2) Be housed in a single container and provided with terminals. If more than two terminals are provided on the artificial antenna, all the terminals must be labelled; and

(g) (3)

(3) Be prominently labelled "FOR TEST USE ONLY".

s 80.265 Requirements for survival craft portable radio equipment.

(a)

(a) Survival craft portable radio equipment must be provided as a single portable buoyant unit consisting of a transmitter, receiver including headphones, power supply, grounding system, antenna system and line for lowering the apparatus. Each totally enclosed lifeboat must comply with the additional equipment requirements specified in this section:

(a) (1)

(1) The radio must float in sea water and withstand a drop into sea water in various positions from a height of 6 meters (20 feet), without requiring repair or adjustment other than normal antenna tuning. The operating controls, indicating devices and instruments, including the headphones, must be protected against physical damage and from prolonged exposure to the weather. The radio must withstand submersion in sea water so that no part is less than 5 centimeters (2 inches) below the surface of the water for two hours without leaking;

(a) (2)

(2) The radio must be fitted with handles or grips. It must be carryable by either one or two persons;

(a) (3)

(3) The radio must be designed to attach to a lifeboat thwart by lashing or other acceptable means;

(a) (4)

(4) The radio, exclusive of the line for lowering, must not weigh more than 27 kilograms (60 pounds). A radio for use in a totally enclosed lifeboat must not weigh more than 18 kilograms (40 pounds);

(a) (5)

(5) The line for lowering must consist of not less than 12 meters (40 feet) of 9 thread manila or sisal rope, or the equivalent thereof, which must be securely attached to the radio at all times;

(a) (6)

(6) All removable components necessary for the proper operation of the radio must be attached to this equipment;

(a) (7)

(7) Each radio must have a durable removable plate showing clearly the survival craft radio call sign in letters and digits and in characters of the Morse code; and

(a) (8)

(8) The maximum overall dimensions of the radio to be used in totally enclosed lifeboats including accessories must not exceed 35 by 40 by 50 centimeters (14 by 16 by 20 inches).

(b) (1)

(b)(1) Portable survival craft radio transmitters must meet the following requirements:

Operating frequency (kHz)	Frequency tolerance		Type of emission	Modulation percentage (average of modulation percentage of positive and	Modulation frequency	Average power output into specified artificial antenna	Artificial antenna
	Parts [FN1] in 10 super6	Hz [FN2]					

				negative peaks)			
500	5,000	20	A2A and A2B or H2A and H2B.	Not less than 70.	Not less than 450 nor greater than 1350 Hertz.	Not less than 1.7 watts.	10 ohm resistance, 75 picofarads capacitance.
500	5,000	20	...do	...do	...do	Not less than 2 watts [FN3].	15 ohms resistance, 100 picofarads capacitance.
8364	200	50	A2A and A3N or H2A and H3N.	...do	...do	Not less than 4 watts.	40 ohms resistance.

FN1 For equipment approved before November 30, 1977.
FN2 For equipment approved after November 29, 1977.
FN3 In the case of equipment approved prior to May 26, 1965, the power output may be 1.7 watts into an artificial antenna of 10 ohms resistance and 75 picofarads capacitance.

(b) (2)
(2) The transmitter must be equipped with a visual indicator or indicators such as neon tubes to show antenna circuit resonance.
Failure of the indicator(s) must not keep the transmitter from operating.
(c)
(c) Portable survival craft receivers must meet the following requirements:
(c) (1)
(1) The audio output must be one milliwatt with a signal to noise power ratio of at least 10 to 1, when the receiver is supplied through the following artificial antennas with the respective radio frequency signals:

Operating frequency, (kHz)	Signal strength (microvolts)	Modulation factor	Modulation (Hz)	Artificial antenna
500	25	0.3	400	10 ohms resistance and 100 picofarads capacitance. [FN1]
8364	100	0.3	400	40 ohms resistance.